FUNDAMENTALS OF DIGITAL SIGNAL PROCESSING

THEORY AND APPLICATIONS

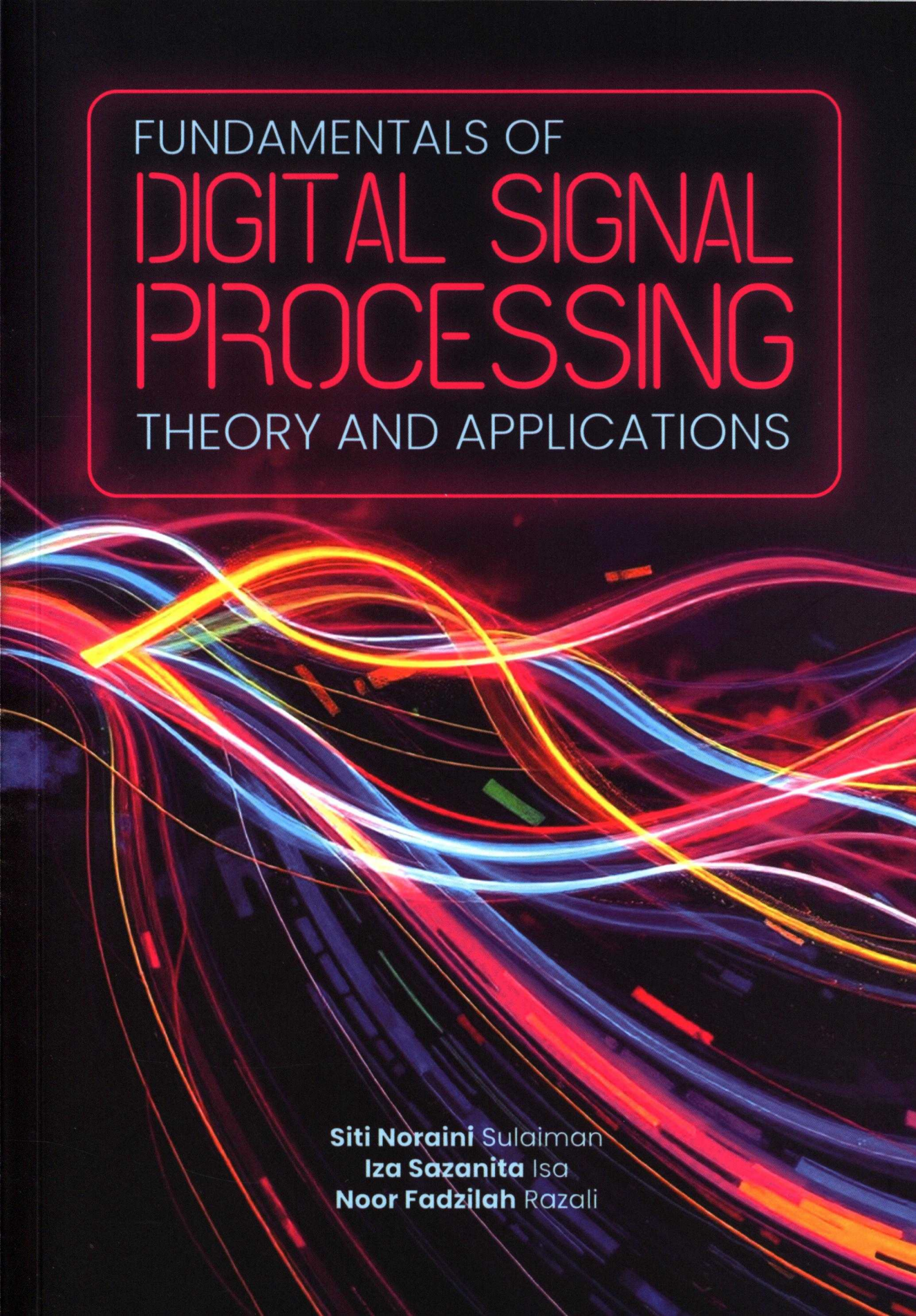

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TABLE OF CONTENTS

List of Figures ix
List of Tables xiii
Preface xv
Acknowledgements xvii

CHAPTER 1: INTRODUCTION TO DIGITAL SIGNAL PROCESSING 1

Learning Outcomes 2
Introduction 2
Definition of Signal 3
Continuous-Time Signals 3
Discrete-Time Signals 4
Digitisation of Signals 5
Basic Discrete-Time Signal Representation 8
Basic Discrete-Time Signals 11
Definition of Systems 20
Classification of Discrete-Time Systems 21
DSP and SDG 9: Industry, Innovation, and Infrastructure 28
Summary and Review Quiz 29

CHAPTER 2: DISCRETE-TIME LINEAR TIME-INVARIANT (LTI) SYSTEMS 31

Learning Outcomes 31
Introduction 32
Recursive and Non-Recursive Difference Equations 33
Definition of Finite Impulse Response (FIR) and Infinite Impulse Response (IIR) Systems 34

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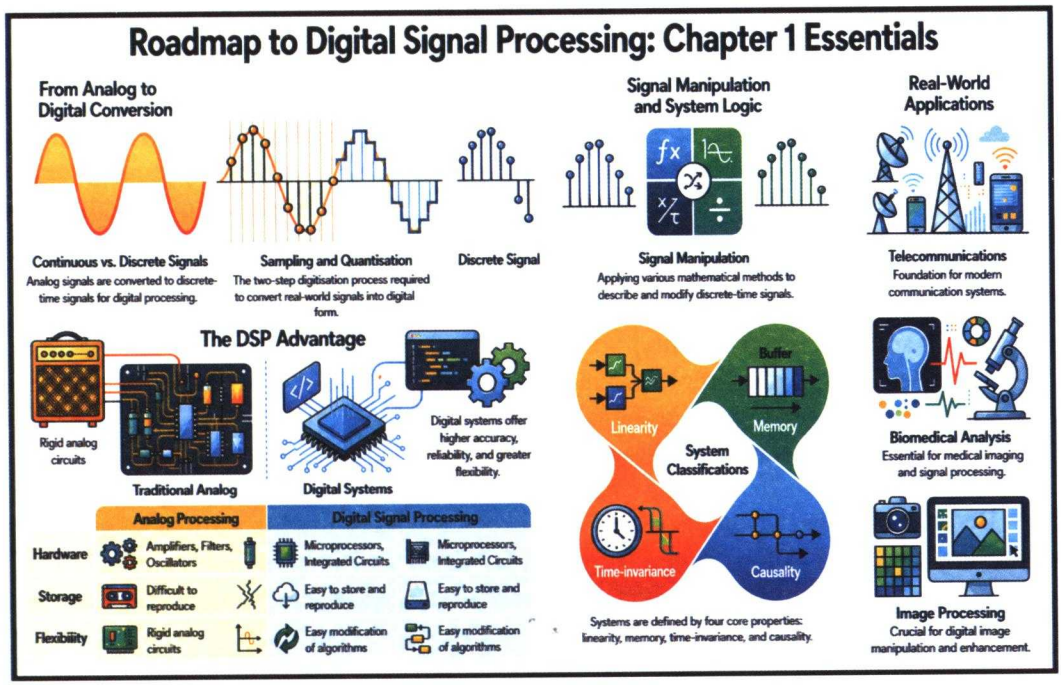
CHAPTER 1

INTRODUCTION TO DIGITAL SIGNAL PROCESSING

Digital Signal Processing (DSP) has developed rapidly over the past 40 years due to significant advances in digital computer technology and integrated-circuit fabrication. This chapter introduces the fundamental concepts of digital signals and systems that form the backbone of modern technological applications.

We begin by defining signals and distinguishing between continuous-time and discrete-time signals. The chapter then explains the digitisation process through sampling and quantisation. Next, several basic discrete-time signals and signal manipulations are introduced. Finally, the concept of systems and the classification of discrete-time systems are discussed.



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THEORY AND APPLICATIONS

This book provides comprehensive coverage of the basic principles and fundamentals of digital signal processing (DSP), including mathematical concepts applied to solve engineering problems. It conceptually emphasises on digital systems theory and a structured introduction to DSP, focusing on understanding core concepts and their practical applications. The content covers key topics such as discrete-time signals and systems, Z-transform, system analysis, stability, causality, and methods for solving difference equations.

This edition is well supported by numerous practice problems and clear illustrations to help readers achieve the course outcomes. By the end of this book, readers will be able to understand the DSP techniques to perform analysis of complex engineering problems, determine relevant and appropriate methods that meet the desired requirement to solve complex engineering problems, and lastly, to demonstrate the usage of modern engineering software in designing digital filters to solve complex engineering problems.

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